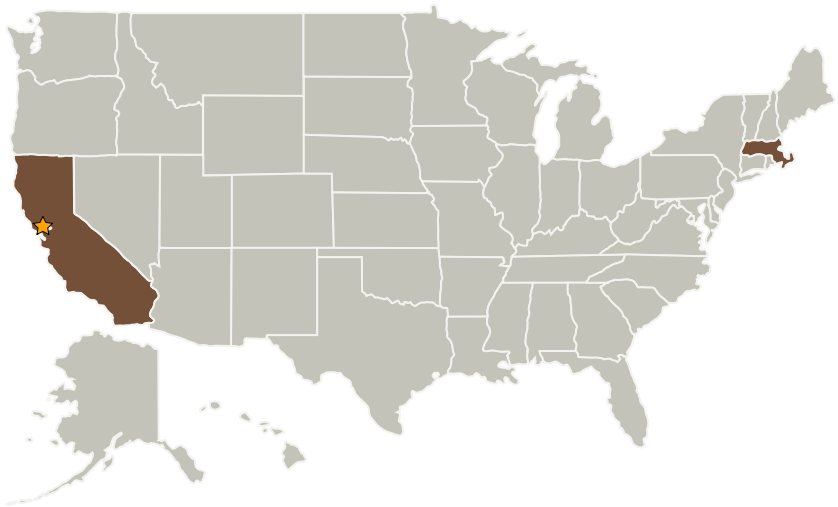
Single Molecule Scanning of DNA Radiation Oxidative Damage, Phase I

Completed Technology Project (2005 - 2005)

Project Introduction

This proposal will develop an assay to map genomic DNA, at the single molecule level and in a nanodevice, for oxidative DNA damage arising from radiation exposure; this will result in a highly quantitative approach to real-time health monitoring, dose response studies, studies of cancer progression, and systematic analyses of immunologically compromised cells. Exposure to radiation damages DNA. Reactive oxygen species (ROS) are liberated, causing oxidative damage to DNA bases. The major consequence of this damage is misincorporation of bases during replication, leading to irreversible cell damage, cancer or compromised cell function. Oxidatively damaged genomic DNA is tagged at the lesions using specific antibodies, and the resultant DNA is scanned in a linear manner by our single molecule nanodevice. The locations, amount, and type of lesions are recorded for each DNA molecule. Megabase pair DNA is scanned by the reader in milliseconds, at ultra-sensitive single molecule detection limits. The technology is highly practical based on our significant experiences in developing single molecule scanning technologies. The potential nanoscale device and analysis speed create new possibilities for routine implementation. This addresses a current unmet need since there are no existing technologies that allow comprehensive assessment of DNA oxidative damage.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Ames Research Center (ARC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Ames Research Center(ARC)	Lead Organization	NASA Center	Moffett Field, California
The DNA Medicine Institute	Supporting Organization	Industry	Cambridge, Massachusetts

Primary U.S. Work Locations	
California	Massachusetts

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Eugene Chan

Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.5 Radiation
    - TX06.5.1 Radiation Transport and Risk Modeling